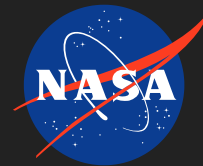


# Exploring the Connection Between Galactic Magnetic Fields and Star Formation with the Balloon-borne Large Aperture Submillimeter

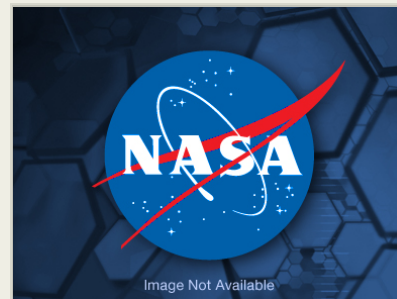
## Telescope - BLAST

Completed Technology Project (2014 - 2015)



### Project Introduction

In my 2012 NASA Earth and Space Science Fellowship application I proposed to design a set of highly-multiplexed bolometer arrays at 250, 350, and 500 micron for the next-generation BLASTPol experiment. In my 2013 progress report, I outlined the preliminary designs, simulations, and work on readout electronics. In the fall of 2013, the funding for the new version of BLAST began, and work on the telescope design rose dramatically. Over the previous year, I have achieved considerable accomplishments in all areas outlined in my last progress report. I designed a thermal blackbody system to test the noise level of a 250 micron prototype array. These tests proved that our 250 micron test detectors can see photon noise at our expected loading level. I have also designed a two channel homodyne system to more accurately measure the detector noise. After a second verification, we can move on to the more noise-stringent 500 micron detectors, as well as a dual-polarization pixel design. Along with our collaborators at NIST, I have designed a path to achieve the finalized array designs at all three bands. Last fall, my focal plane array design passed a preliminary design review, and I have begun the finalized design for their critical design review this summer. The readout electronics have been determined, and four ROACHes will be needed to read out the three BLAST arrays. Last summer, I created a preliminary design for ROACH housing on the gondola. Along with thermal modeling, extensive front-end software and firmware development will need to be completed in the next year in order to operate the full detector arrays. This past fall, I collaborated on three proposals for ATCA, Mopra, and ALMA time. These proposals are to observe protostellar cores to complement BLAST observations. My contribution to the proposals was to produce 1 arcmin square images, and spectral energy distributions (SEDs) of each of the ~100 protostellar candidates. These data allowed our team to select 20 promising protostellar candidates for the observation proposals. We were awarded time on both ATCA and Mopra, and are awaiting the results for ALMA. Soon, I will have two (three if awarded ALMA time) sets of complementary data on protostellar cores in Vela C to help analyze with the rest of the BLAST collaboration. This past year was filled with tremendous amounts of scientific progress, and the coming year promises the same. I am very confident that BLAST will be ready for a 2016 Antarctic Campaign.



Exploring the Connection Between Galactic Magnetic Fields and Star Formation with the Balloon-borne Large Aperture Submillimeter Telescope - BLAST

### Table of Contents

Project Introduction	1
Organizational Responsibility	1
Primary U.S. Work Locations and Key Partners	2
Project Management	2
Technology Areas	2
Target Destination	2

### Organizational Responsibility

#### Responsible Mission Directorate:

Science Mission Directorate (SMD)

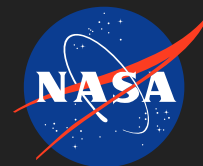
#### Responsible Program:

Astrophysics

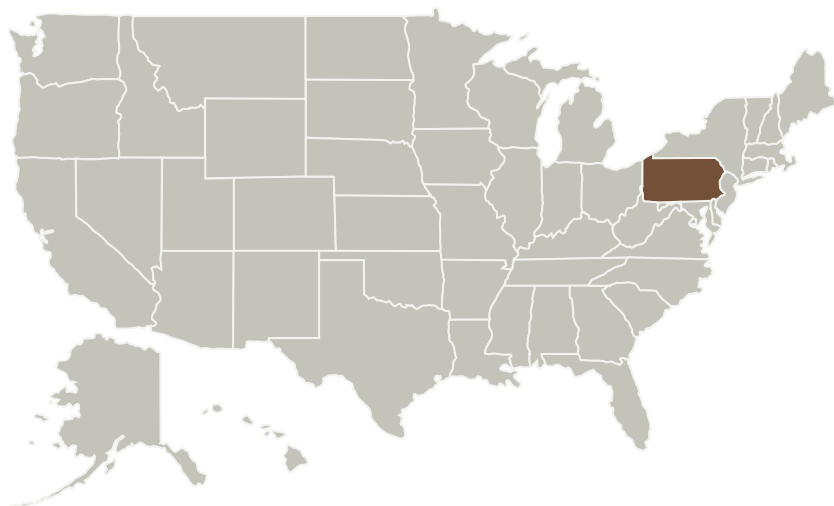
# Exploring the Connection Between Galactic Magnetic Fields and Star Formation with the Balloon-borne Large Aperture Submillimeter

## Telescope - BLAST

Completed Technology Project (2014 - 2015)



### Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Clinical Practices of the University of Pennsylvania	Supporting Organization	Academia	Philadelphia, Pennsylvania
University of Pennsylvania	Supporting Organization	Academia	Philadelphia, Pennsylvania

### Primary U.S. Work Locations

Pennsylvania

### Project Management

#### Program Manager:

Joe Hill-kittle

#### Principal Investigator:

Mark J Devlin

#### Co-Investigator:

Leona Joseph

### Technology Areas

#### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.1 Detectors and Focal Planes

### Target Destination

Outside the Solar System